

PATENT COOPERATION TREATY

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APPLICATION AS PUBLISHED OR REPUBLISHED

Date of mailing (day/month/year)  
07 July 2005 (07.07.2005)

Applicant's or agent's file reference  
Y04S011PCT

International application No.  
PCT/JP2004/012899

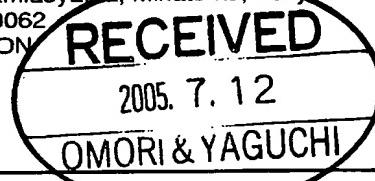
International filing date (day/month/year)  
31 August 2004 (31.08.2004)

Priority date (day/month/year)  
05 September 2003 (05.09.2003)

Applicant  
KITAKYUSHU FOUNDATION FOR THE ADVANCEMENT OF INDUSTRY, SCIENCE AND TECHNOLOGY et al

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**IMPORTANT NOTICE**

The International Bureau transmits herewith the following documents:

copy of the international application as published by the International Bureau on under  
No. WO

copy of international application as republished by the International Bureau on 07 July 2005 (07.07.2005) under  
No. WO 2005/029463

For an explanation as to the reason for this republication of the international application, reference is made to INID codes (15), (48) or (88) (*as the case may be*) on the front page of the attached document.

The International Bureau of WIPO  
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**PATENT COOPERATION TREATY**  
**PCT**

**INTERNATIONAL SEARCH REPORT**

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference  Y04S011PCT	<b>FOR FURTHER ACTION</b>	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No.  PCT/JP2004/012899	International filing date (day/month/year)  31/08/2004	(Earliest) Priority Date (day/month/year)  05/09/2003
Applicant  KITAKYUSHU FOUNDATION FOR THE ADVANCEMENT OF IND.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b.  With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2.  **Certain claims were found unsearchable** (See Box II).

3.  **Unity of invention is lacking** (see Box III).

4. With regard to the **title**,

- the text is approved as submitted by the applicant.
- the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- the text is approved as submitted by the applicant.
- the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regards to the **drawings**,

- a. the figure of the drawings to be published with the abstract is Figure No. 1

- as suggested by the applicant.
- as selected by this Authority, because the applicant failed to suggest a figure.
- as selected by this Authority, because this figure better characterizes the invention.

- b.  none of the figures is to be published with the abstract.

**INTERNATIONAL SEARCH REPORT****Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)**

Method for recovering target speech by extracting signal components falling in a speech segment, which is determined based on separated signals obtained through the Independent Component Analysis, thereby minimizing the residual noise in the recovered target speech. The present method comprises: the first step of receiving target speech emitted from a sound source and a noise emitted from another sound source and extracting estimated spectra  $Y^*$  corresponding to the target speech by use of the Independent Component Analysis; the second step of separating from the estimated spectra  $Y^*$  an estimated spectrum series group  $y^*$  in which the noise is removed by applying separation judgment criteria based on the kurtosis of the amplitude distribution of each of estimated spectrum series in  $Y^*$ ; the third step of detecting a speech segment and a noise segment of the total sum  $F$  of all the estimated spectrum series in  $y^*$  by applying detection judgment criteria based on a predetermined threshold value  $T$  that is determined by the maximum value of  $F$ ; and the fourth step of extracting components falling in the speech segment from the estimated spectra  $Y^*$  to generate a recovered spectrum group for recovering the target speech.

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 G10L11/02 G10L19/02 G10L21/02

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 G10L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 02/29780 A (CLARITY LLC ; ERTEN GAMZE (US)) 11 April 2002 (2002-04-11)  abstract  page 1, lines 6-12,20-23  page 2, lines 19-26  page 3, lines 2-8  page 4, lines 5-13  page 6, line 25 – page 7, line 17  page 20, line 6 – page 22, line 24  figures 8-10,14,15</p> <p>-----</p> <p style="text-align: center;">-/--</p>	1-6



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&\* document member of the same patent family

Date of the actual completion of the international search

8 November 2004

Date of mailing of the international search report

24/11/2004

Name and mailing address of the ISA

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	HYVARINEN A ET AL: "Independent component analysis: algorithms and applications" NEURAL NETWORKS, ELSEVIER SCIENCE PUBLISHERS, BARKING, GB, vol. 13, no. 4-5, June 2000 (2000-06), pages 411-430, XP004213197 ISSN: 0893-6080 cited in the application the whole document -----	1-6
A	GOTANDA ET AL.: "Permutation correction and speech extraction based on split spectrum through FastICA" IN PROCEEDINGS OF THE 4TH INTERNATIONAL SYMPOSIUM ON INDEPENDENT COMPONENT ANALYSIS AND BLIND SIGNAL SEPARATION, ICA 2003, 1 April 2003 (2003-04-01), pages 379-384, XP002304355 the whole document -----	1,3
A	SARUWATARI ET AL: "Speech enhancement and recognition in car environment usign blind source separation and subband elimination processing" 4TH INTERNATIONAL SYMPOSIUM ON INDEPENDENT COMPONENT ANALYSIS AND BLIND SIGNAL SEPARATION, ICA2003, April 2003 (2003-04), pages 367-372, XP002304368 NARA, JAPAN pag. 370, left column, section 3.2 -----	1,3
A	MURATA N ET AL: "An approach to blind source separation based on temporal structure of speech signals" NEUROCOMPUTING ELSEVIER NETHERLANDS, vol. 41, 1998, pages 1-24, XP002304356 ISSN: 0925-2312 abstract pag 1-3, section 2 pag 8-9, section 3 -----	1,3
A	LIN C-T ET AL: "NOISY SPEECH SEGMENTATION/ENHANCEMENT WITH MULTIBAND ANALYSIS AND NEURAL FUZZY NETWORKS" INTERNATIONAL JOURNAL OF PATTERN RECOGNITION AND ARTIFICIAL INTELLIGENCE, WORLD SCIENTIFIC PUBLISHING COMPAGNY, SINGAPORE, SI, vol. 16, no. 7, November 2002 (2002-11), pages 927-955, XP001143964 ISSN: 0218-0014 abstract -----	1,3

## Information on patent family members

International Application No  
PCT/JP2004/012899

Patent document cited in search report	Publication date		Patent family member(s)		Publication date
WO 0229780	A 11-04-2002	AU WO US	9498901 A 0229780 A2 2002116187 A1		15-04-2002 11-04-2002 22-08-2002